



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002NE1B

Title: Relating landscape scale characteristics with phosphorus loss potential to surface waters

Project Type: Research

Focus Categories: Non Point Pollution, Water Quality, Agriculture

Keywords: phosphorus loss, water, eutrophication, manure, soil management

Start Date: 05/01/2002

End Date: 04/30/2003

Federal Funds Requested: \$3,885

Non-Federal Matching Funds Requested: \$7,903

Congressional District: Nebraska 1

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Abstract

It is estimated that annual production of feedlot beef cattle manure in the United States is 24 million Mg, and in Nebraska alone is 5.1 million Mg. Disposal of this quantity of manure presents a significant environmental and economic problem. Traditional application to agricultural land on a nitrogen (N) basis has been shown to successfully supply N for crop growth. Nitrogen-based application, however, results in overapplication of phosphorus (P) because of the disparity of N:P ratios in manure compared to N:P ratios in agronomic plants. As a consequence, producers and those responsible for environmental monitoring must confront the need to increase the land base for manure if applied on a P basis in order to avoid such overapplication, which could result in eutrophication and reduced water quality. In recent years, research has been conducted to identify those factors which are most strongly related to undesirable P loss from agricultural lands. These factors include form of P applied (fertilizer or manure); time and method of P application; and land characteristics such as soil P level, slope, and texture. These factors have been summarized into a quantity called the Phosphorus Index (PI), which attempts to integrate quantitative estimates of factors which are critical to P loss from agricultural land. The database on which the PI has been developed is somewhat limited, however, and several of the weighting factors used have been challenged as inappropriate for all situations. As a result, it is necessary to continue gathering data and testing estimates of P loss using the PI and other predictors. In addition, the PI, even where its utility has been verified, does not offer the ease of use that would be desirable for a producer. A graphical

representation of the potential of a land area to lose applied P would be broadly useful to a range of audiences. Such a representation could incorporate the PI or some other estimate of P loss, combined with information available on soils from databases maintained by the Natural Resource Conservation Service or other entities. The overall objective of the research proposed here is to develop relationships between soil chemical characteristics related to P bioavailability and soil properties accessible in GIS databases. Our specific research objective is: To relate BAP to site characteristics of manured and non-manured soil drawn from landscape-scale databases such as that maintained by the NRCS. The tasks to accomplish this objective will include: 1) Identify and characterize a selection of sites which have or have not received animal manure. Collect Intact surface horizon samples at each location for analysis of basic soil chemical and physical properties, including pH, cation exchange capacity, organic matter content, and textural class, among other properties; 2) Measure BAP on these sites using a group of standard agronomic and environmental tests; 3) Relate BAP to site characteristics drawn from landscape-scale databases such as that maintained by the Natural Resource Conservation Service (NRCS); 4) Use results of task 3 to produce maps of areas at high, moderate, and low risk for P loss which may degrade surface water quality.